

Amendments to the Claims

This listing of claims replaces all prior versions and listings of claims in the application.

Listing of Claims

1. (Previously Presented) A method of manufacturing a semiconductor device, the method comprising:

forming a conductive film over a semiconductor with an insulating film therebetween;

forming a resist pattern over the conductive film by using one of a photomask having a diffraction grating pattern and a reticle having a diffraction grating pattern, wherein a thickness of an edge portion of the resist pattern is smaller than a thickness of a middle portion of the resist pattern;

forming a gate electrode by etching using the resist pattern, wherein a thickness of an edge portion of the gate electrode is smaller than a thickness of a middle portion of the gate electrode; and

introducing an impurity element into the semiconductor with the gate electrode as a mask to form a first impurity region and a second impurity region in the semiconductor, wherein the first impurity region is not overlapped with the gate electrode and the second impurity region is overlapped with the edge portion of the gate electrode.

2-3. (Canceled)

4. (Previously Presented) A method of manufacturing a semiconductor device, the method comprising:

forming a conductive film over a semiconductor with an insulating film therebetween;

forming a resist pattern over the conductive film by using one of a photomask having a light shielding portion and a translucent film and a reticle having a light shielding portion and a

translucent film, wherein the translucent film is adjacent to the one of the photomask and the reticle, and wherein a thickness of an edge portion of the resist pattern is smaller than a thickness of a middle portion of the resist pattern;

forming a gate electrode by etching using the resist pattern, wherein a thickness of an edge portion of the gate electrode is smaller than a thickness of a middle portion of the gate electrode; and

introducing an impurity element into the semiconductor with the gate electrode as a mask to form a first impurity region and a second impurity region in the semiconductor, wherein the first impurity region is not overlapped with the gate electrode and the second impurity region is overlapped with the edge portion of the gate electrode.

5-10. (Canceled)

11. (Original) The method of manufacturing a semiconductor device according to claim 1, wherein a plurality of slit portions are used as the diffraction grating pattern.

12-13. (Canceled)

14. (Original) The method of manufacturing a semiconductor device according to claim 4, wherein a phase of an exposure light is shifted by one wavelength by passing through the translucent film portion, the exposure light being a single wavelength light.

15-17. (Canceled)

18. (Previously Presented) The method of manufacturing a semiconductor device according to claim 1, wherein the edge portion of the resist pattern has a tapered configuration.

19-20. (Canceled)

21. (Previously Presented) The method of manufacturing a semiconductor device according to claim 4, wherein the edge portion of the resist pattern has a tapered configuration.

22-31. (Canceled)

32. (Original) The method of manufacturing a semiconductor device according to claim 1, wherein the semiconductor is a semiconductor layer formed on an insulating surface.

33. (Original) The method of manufacturing a semiconductor device according to claim 4, wherein the semiconductor is a semiconductor layer formed on an insulating surface.

34. (Canceled)

35. (Original) The method of manufacturing a semiconductor device according to claim 1, wherein the semiconductor is a semiconductor substrate.

36. (Original) The method of manufacturing a semiconductor device according to claim 4, wherein the semiconductor is a semiconductor substrate.

37-51. (Canceled)

52. (Original) The method of manufacturing a semiconductor device according to claim 1, wherein the etching is dry etching.

53. (Original) The method of manufacturing a semiconductor device according to claim 4, wherein the etching is dry etching.

54. (Canceled)

55. (Previously Presented) The method of manufacturing a semiconductor device according to claim 1, wherein the semiconductor device is incorporated into an electronic device selected from the group consisting of a video camera, a digital camera, a projector, a head mounted display, a navigation system, a car stereo, a personal computer, a portable information terminal.

56-57. (Canceled)

58. (Previously Presented) The method of manufacturing a semiconductor device according to claim 4, wherein the semiconductor device is incorporated into an electronic device selected from the group consisting of a video camera, a digital camera, a projector, a head mounted display, a navigation system, a car stereo, a personal computer, a portable information terminal.

59-64. (Canceled)

65. (Currently Amended) A method of manufacturing a semiconductor device comprising the steps of:

forming a conductive film over a semiconductor with an insulating film therebetween;

forming a resist pattern **[[on]]** over the conductive film by using one of a photomask having a diffraction grating pattern and a reticle having a diffraction grating pattern, wherein a thickness of an edge portion of the resist pattern is smaller than a thickness of a middle portion of the resist pattern;

forming a gate electrode by etching using the resist pattern, wherein a thickness of an edge portion of the gate electrode is smaller than a thickness of a middle portion of the gate electrode; and

introducing an impurity element into the semiconductor with the gate electrode as a mask to form a first impurity region and a second impurity region in the semiconductor, wherein the second impurity region is in contact with a channel forming region, and the first impurity region is in contact with the second impurity region.

66. (Previously Presented) The method of manufacturing a semiconductor device according to claim 65, wherein a plurality of slit portions are used as the diffraction grating pattern.

67. (Previously Presented) The method of manufacturing a semiconductor device according to claim 65, wherein the edge portion of the resist pattern has tapered configuration.

68. (Previously Presented) The method of manufacturing a semiconductor device according to claim 65, wherein the semiconductor is a semiconductor layer formed on an insulating surface.

69. (Previously Presented) The method of manufacturing a semiconductor device according to claim 65, wherein the semiconductor is a semiconductor substrate.

70. (Previously Presented) The method of manufacturing a semiconductor device according to claim 65, wherein the etching is dry etching.

71. (Previously Presented) The method of manufacturing a semiconductor device according to claim 65, wherein the semiconductor device is incorporated into an electronic device selected from the group consisting of a video camera, a digital camera, a projector, a head mounted display, a navigation system, a car stereo, a personal computer, a portable information terminal.

72. (Currently Amended) A method of manufacturing a semiconductor device comprising the steps of:

forming a conductive film over a semiconductor with an insulating film therebetween;

forming a resist pattern [[on]] over the conductive film by using one of a photomask having a light shielding portion and a translucent film and a reticle having a light shielding portion and a translucent film, wherein the translucent film is adjacent to the one of the photomask and the reticle, and wherein a thickness of an edge portion of the resist pattern is smaller than a thickness of a middle portion of the resist pattern;

forming a gate electrode by etching using the resist pattern, wherein a thickness of an edge portion of the gate electrode is smaller than a thickness of a middle portion of the gate electrode; and

introducing an impurity element into the semiconductor with the gate electrode as a mask to form a first impurity region and a second impurity region in the semiconductor, wherein the second impurity region is in contact with a channel forming region, and the first impurity region is in contact with the second impurity region.

73. (Previously Presented) The method of manufacturing a semiconductor device according to claim 72, wherein a phase of an exposure light is shifted by one wavelength by passing through the translucent film portion, the exposure light being a single wavelength light.

74. (Previously Presented) The method of manufacturing a semiconductor device according to claim 72, wherein the edge portion of the resist pattern has tapered configuration.

75. (Previously Presented) The method of manufacturing a semiconductor device according to claim 72, wherein the semiconductor is a semiconductor layer formed on an insulating surface.

76. (Previously Presented) The method of manufacturing a semiconductor device according to claim 72, wherein the semiconductor is a semiconductor substrate.

77. (Previously Presented) The method of manufacturing a semiconductor device according to claim 72, wherein the etching is dry etching.

78. (Previously Presented) The method of manufacturing a semiconductor device according to claim 72, wherein the semiconductor device is incorporated into an electronic device selected from the group consisting of a video camera, a digital camera, a projector, a head mounted display, a navigation system, a car stereo, a personal computer, a portable information terminal.

79-85. (Canceled)

86. (Previously Presented) A method of manufacturing a semiconductor device comprising the steps of:

forming a conductive film over a semiconductor with an insulating film therebetween;

forming a resist pattern over the conductive film by using one of a photomask and a reticle, wherein a thickness of an edge portion of the resist pattern is smaller than a thickness of a middle portion of the resist pattern; and

forming a gate electrode by etching using the resist pattern, wherein a thickness of an edge portion of the gate electrode is smaller than a thickness of a middle portion of the gate electrode.

87. (Previously Presented) The method of manufacturing a semiconductor device according to claim 86, wherein a plurality of slit portions are used as the diffraction grating pattern.

88. (Previously Presented) The method of manufacturing a semiconductor device according to claim 86, wherein the edge portion of the resist pattern has tapered configuration.

89. (Previously Presented) The method of manufacturing a semiconductor device according to claim 86, wherein the semiconductor is a semiconductor layer formed on an insulating surface.

90. (Previously Presented) The method of manufacturing a semiconductor device according to claim 86, wherein the semiconductor is a semiconductor substrate.

91. (Previously Presented) The method of manufacturing a semiconductor device according to claim 86, wherein the etching is dry etching.

92. (Previously Presented) The method of manufacturing a semiconductor device according to claim 86, wherein the semiconductor device is incorporated into an electronic device selected from the group consisting of a video camera, a digital camera, a projector, a head mounted display, a navigation system, a car stereo, a personal computer, a portable information terminal.

93. (Previously Presented) A method of manufacturing a semiconductor device comprising the steps of:

forming a conductive film over a semiconductor with an insulating film therebetween;
forming a resist pattern over the conductive film by using one of a photomask and a reticle having a light shielding portion, a translucent film, wherein the translucent film is adjacent to one of the photomask and the reticle, and wherein a thickness of an edge portion of the resist pattern is smaller than a thickness of a middle portion of the resist pattern; and

forming a gate electrode by etching using the resist pattern, wherein a thickness of an edge portion of the gate electrode is smaller than a thickness of a middle portion of the gate electrode.

94. (Previously Presented) The method of manufacturing a semiconductor device according to claim 93, wherein a phase of an exposure light is shifted by one wavelength by passing through the translucent film portion, the exposure light being a single wavelength light.

95. (Previously Presented) The method of manufacturing a semiconductor device according to claim 93, wherein the edge portion of the resist pattern has tapered configuration.

96. (Previously Presented) The method of manufacturing a semiconductor device according to claim 93, wherein the semiconductor is a semiconductor layer formed on an insulating surface.

97. (Previously Presented) The method of manufacturing a semiconductor device according to claim 93, wherein the semiconductor is a semiconductor substrate.

98. (Previously Presented) The method of manufacturing a semiconductor device according to claim 93, wherein the etching is dry etching.

99. (Previously Presented) The method of manufacturing a semiconductor device according to claim 93, wherein the semiconductor device is incorporated into an electronic device selected from the group consisting of a video camera, a digital camera, a projector, a head mounted display, a navigation system, a car stereo, a personal computer, a portable information terminal.

100. (Previously Presented) The method of manufacturing a semiconductor device according to claim 1, wherein slit lines of the diffraction grating pattern are formed so as to be perpendicular to a light shielding portion of the one of the photomask and the reticle.

101. (Previously Presented) The method of manufacturing a semiconductor device according to claim 65, wherein slit lines of the diffraction grating pattern are formed so as to be perpendicular to a light shielding portion of the one of the photomask and the reticle.

102. (Previously Presented) The method of manufacturing a semiconductor device according to claim 86, wherein slit lines of the diffraction grating pattern are formed so as to be perpendicular to a light shielding portion of the one of the photomask and the reticle.

103. (New) A method of manufacturing a semiconductor device comprising:
forming a conductive film over a semiconductor film with an insulating film therebetween;
forming a photoresist layer over the conductive film;
disposing a mask over the photoresist layer, the mask having a first mask portion which substantially blocks light and a second mask portion which partially passes light;
exposing the photoresist layer to light by using the mask;
patterning the photoresist layer after exposing the photoresist layer to form a photoresist pattern which includes a first pattern portion and a second pattern portion with a smaller thickness than the first pattern portion;
etching the conductive layer using the photoresist pattern as a mask to form a gate electrode over the semiconductor film, the gate electrode having a first electrode portion and a second electrode portion with a smaller thickness than the first electrode portion;
forming a first impurity region in the semiconductor by introducing an impurity into a region of the semiconductor film not overlapped by the gate electrode;

forming a second impurity region in the semiconductor by introducing a second impurity through the second electrode portion such that a concentration of the second impurity in the second impurity region is smaller than a concentration of the first impurity in the first impurity region.

104. (New) The method of manufacturing a semiconductor device according to claim 103 wherein the second electrode portion has a tapered configuration.

105. (New) The method of manufacturing a semiconductor device according to claim 103 wherein the mask is a photomask.

106. (New) The method of manufacturing a semiconductor device according to claim 103 wherein the mask is a reticle.

107. (New) The method of manufacturing a semiconductor device according to claim 103 wherein the second mask portion includes a diffraction grating pattern.

108. (New) The method of manufacturing a semiconductor device according to claim 103 wherein the second mask portion includes a translucent film.

109. (New) The method of manufacturing a semiconductor device according to claim 103 wherein the first impurity is the same material as the second impurity.

110. (New) The method of manufacturing a semiconductor device according to claim 103 wherein transparency of the second mask portion monotonically increases as a distance from the first mask portion increases.

111. (New) A method of manufacturing a semiconductor device comprising:

forming a conductive film over a semiconductor substrate with an insulating film therebetween;

forming a photoresist layer over the conductive film;

disposing a mask over the photoresist layer, the mask having a first mask portion which substantially blocks light and a second mask portion which partially passes light;

exposing the photoresist layer to light by using the mask;

patterning the photoresist layer after exposing the photoresist layer to form a photoresist pattern which includes a first pattern portion and a second pattern portion with a smaller thickness than the first pattern portion;

etching the conductive layer using the photoresist pattern as a mask to form a gate electrode over the semiconductor substrate, the gate electrode having a first electrode portion and a second electrode portion with a smaller thickness than the first electrode portion;

forming a first impurity region in the semiconductor substrate by introducing an impurity into a region of the semiconductor substrate not overlapped by the gate electrode;

forming a second impurity region in the semiconductor substrate by introducing a second impurity through the second electrode portion such that a concentration of the second impurity in the second impurity region is smaller than a concentration of the first impurity in the first impurity region.

112. (New) The method of manufacturing a semiconductor device according to claim 111 wherein the second electrode portion has a tapered configuration.

113. (New) The method of manufacturing a semiconductor device according to claim 111 wherein the mask is a photomask.

114. (New) The method of manufacturing a semiconductor device according to claim 111 wherein the mask is a reticle.

115. (New) The method of manufacturing a semiconductor device according to claim 111 wherein the second mask portion includes a diffraction grating pattern.

116. (New) The method of manufacturing a semiconductor device according to claim 111 wherein the second mask portion includes a translucent film.

117. (New) The method of manufacturing a semiconductor device according to claim 111 wherein the first impurity is the same material as the second impurity.